

# PATENT SPECIFICATION

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722,629

Date of filing Complete Specification (under Section 3(3) of the Patents and Designs Acts, 1907 to 1946) July 21, 1953.

Application Date July 22, 1952.

No. 18475/52.

Application Date Dec. 19, 1952.

No. 32214/52.

Application Date Dec. 30, 1952.

No. 32969/52.

Complete Specification Published Jan. 26, 1955.

Index at acceptance:—Class 81(2), B1(H: M).

## COMPLETE SPECIFICATION

### Improvements in and relating to Tampons, Wads or the like, and materials therefor

I, EDWARD CHARLES EDMUND HEMSTED, a British Subject, of Woodcroft, Totteridge Green, London, N.20, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to materials having prophylactic and/or therapeutic properties of use for medical and surgical purposes and to tampons, wads or the like made from such materials.

The main object of the present invention is to provide materials, and tampons, wads or the like thereof, for the aforesaid purposes, more effective than those heretofore known.

The invention consists in a prophylactic or therapeutically-active material for medical purposes comprising a lightly compressed mass of fibres or fibrous material of a kind wholly and completely soluble or dispersible in water and in body fluids, at body temperature impregnated with chemicals having prophylactic or therapeutic properties. By the term "soluble or dispersible" is meant the property of the fibres or fibrous material to dissolve, or form a colloid, or disintegrate into very fine particles in the water or body fluid, whole being thereafter in a fluent condition. The impregnated chemicals are preferably in liquid or gelatinous form and may comprise an oil or the like (adapted to serve as a physical barrier) and/or an acid or the like (serving as a bactericide). The chemicals may be prepared as an emulsion or gel for application to the fibrous mass which may be coated or wrapped in a covering after the chemicals have been applied thereto. The fibrous matter, and the coating or covering are both preferably formed of materials which are disposed of by solution or dispersion as defined above after, say 24—72 hours in use. A tampon of the aforesaid material according to the invention may be of cylindrical form with rounded ends, or pear shaped, or of any other desired shape,

and may be formed by twists in a rope of fibrous material as it is drawn through its various stages of treatment.

The invention will be clearly understood from the following description of one form 60 (given, however, merely by way of example) which it may assume.

In carrying the invention into effect in one convenient manner a tampon or wad suitable for medical or surgical purposes is formed by appropriate pre-shaping and pre-treatment of a fibrous mass which is soluble or dispersible during use, within a period of, say 24 to 72 hours. While any fibres (not excluding synthetic fibres) having such characteristics may be employed, preferred materials so far considered comprise alginate fibres (e.g. sodium or ammonium alginate). This material is carded into a continuous band or ribbon, of, say six inches in width, and few fibres in thickness, and the band is impregnated with an oil (forming a barrier or prophylactic to bacteria) and by an emulsion or gel, (forming a counter agent to bacterial activity).

The emulsion or gel preferably includes the 70 oil, and while any bland oil would form the desired barrier, it is preferred to use one or more mineral oils, or oils having fungicidal properties, these being free from the tendency to become rancid or to encourage bacterial growth characteristic of most animal or vegetable oils. Suitable oils are liquid paraffin B.P. or castor oil B.P.

The gel preferably includes a bactericidal agent which may conveniently comprise water 80 acidified by the addition of one or more suitable acids e.g. lactic acid, boric acid, citric acid, acetic acid, etc., or with ricinoleic acid emulsified therein.

The desired chemical materials such as 85 those indicated above (excluding the oil) are preferably formed as a gel of suitable concentration with water, by the use of suitable gel-forming materials, e.g. gum tragacanth, bassorin gum, agar-agar, sodium alginate, etc., 90

with or without glycerine to facilitate saturation. In the gel thus formed may be included bactericidal materials (e.g. one or more of the acids referred to above) and/or of other medicaments (e.g. for the treatment of leucorrhoea). The acidulation should be adjusted so that the hydrogen ion gives a pH reading between, say 3.5 and 4.5 and preferably about 3.8.

- 10 The gel prepared as indicated in the next preceding paragraph, and an oil such as referred to above one thereafter emulsified in suitable apparatus, preferably with the assistance of an acid stable emulsifying agent, e.g. the agent known commercially as Tegacid. The final emulsion is preferably of substantial viscosity, corresponding for example to that of stiff treacle, and should remain stable within a normal ambient temperature range and storage conditions (bearing in mind that it may be used in the tropics).

- The aforesaid band or ribbon of fibrous material is impregnated with the above-described emulsion by being passed on a belt carrier or the like through a tank or trough containing the emulsion, or running between rollers or other mechanical means to which the emulsion is fed. After impregnation the band is freed from excess emulsion by light roller pressure or the like and is then removed from the carrier belt by a rolling action whereby it is rolled up about an axis lying at about 45° to the direction of movement of the belt so that it is withdrawn as a continuous rope of cylindrical form, having a diameter of, say 1—1½ inches.

- An impregnated rope formed in the manner described above is finally cut into suitable lengths for use. The lengths may be externally coated with a soluble or dispersible covering material. For the purpose of division the rope is twisted through 360° at suitable intervals, say 2—2½ inches, in order to provide a taper at each end of each section, and the sections separated by cutting the rope at the necks formed by the twisting, between the sections.

- For coating, the cut sections are then chilled to, say 40—42° F., by placing them in or passing them through refrigerating apparatus, and while at that temperature are lightly sprayed with, or rapidly dipped in a bath of, an oil, e.g. petroleum oil, somewhat denser than the paraffin or other impregnated oil. A suitable oil-covering is that known under the Registered Trade Mark "Vaseline". This tends to harden on the surface of the rope section, which is thereupon provided with a final outer coating of soluble or dispersible material, adapted to provide a rather stiff, smooth surface. A suitable material for this final coating is sodium or ammonium alginate, or ethyl/hydroxyethyl cellulose, adjusted to substantial viscosity and selected for its transparent characteristics. This may be applied

by spraying on to the rope section, or by immersing the section in it, whereafter the coating should be rapidly dried to give a glazed, semi-rigid coating. The tampon is then ready for packing, storage and subsequent use.

In a modified form of the invention wherein the emulsion is more fully protected from deterioration and the like, the emulsion (including a bactericide), prepared as described above, may be encased in a very thin water-soluble container e.g. of gelatin or a soluble alginate, and the fibrous ribbon, prepared as described above, may be wrapped round this container. The rolled fibrous material may then be cut and formed into short lengths as previously described, and the lengths may also be externally coated in the manner described above.

An alternative or additional manner of protecting a tampon, wad or the like such as described above, from contamination and/or deterioration prior to use, in accordance with the invention is to encase the tampon or wad in an outer covering or preformed film or sheet of soluble or dispersible material. The material employed should be selected after consideration of the conditions to which it is to be subjected; e.g. for tropical conditions it should remain firm and unaffected by tropical temperatures and humidity. A suitable material, referred to by way of example is cellulose ether. It will be noted that the wrapped tampon can be employed without removing the covering which dissolves or disperses with the tampon proper. The film or sheet covering material may be cut into suitable portions for separately covering the tampons, and wrapped or otherwise formed as a cover around the tampon. Preferably the wrapping or covering is sealed (e.g. by use of water whereby the material is partially dissolved) during the encasing operation.

For carrying out the covering operation there may be employed any convenient wrapping machine, such as a machine used for wrapping toffees, sweetmeats and the like in transparent film. To such a machine is supplied a sheet or strip, in film thickness, of a water-soluble covering material, such as a cellulose ether, e.g. that known under the Registered Trade Mark "Modocoll M", and the tampons or the like are loaded into a hopper or bin of the machine which thereupon wraps each tampon in a portion of the film material cut from the sheet or strip, and ejects it. The ends of the wrapped covering may be twisted or nipped together, and in either case it is preferred that the edges, and twisted or nipped ends of the material shall be moistened, and if necessary thereafter subjected to heat, or a hot air stream, in order that they may become softened and sealed together. If the ends are twisted, they may be turned so far as to be

broken away from the main part of the covering, to leave a reasonably smooth end to the wrapped tampon.

In the manufacture of fibrous materials and 5  
tampons, wads or the like made therefrom, as described above it is sometimes necessary to ensure that the fibres are loosely "felted" or matted together to a desired degree. According to a further feature of the present invention this result may be achieved by depositing 10  
the fibres on to a vibrating surface whereby the fibres are caused to matt or "felt" into a soft uniform layer of desired thickness and compactness. The teasing or opening up of the fibres may be effected by a mill, (e.g. 15  
a swinging hammer mill of known kind in which freely swinging hammers on a rotor move adjacent to a screen but are so mounted that they are unable to contact one another or the screen). The vibrating surface may be a conveyor belt maintained in vibration in a direction transversely to its conveyor movement. The violence and duration of the vibrating treatment of the separated fibres is 20  
selected to ensure the desired degree of "feltedness". The fibres may be delivered on to the vibrating surface through an outlet hopper of the mill, and the rate of delivery is selected, (having regard to the rate of movement of the conveyor belt, if that constitutes the vibratory surface) so as to ensure that the amount of 25  
fibrous material is suitable to provide a felted layer of the desired thickness.

The impregnation of the fibrous mass, 35  
referred to above, may be effected before the fibres are carded, and subsequently "felted" or matted by the vibratory surface, and may be carried out by bringing together a solution or suspension of the chemicals, and a moist 40  
fibrous mass in a centrifuge revolving at high speed and maintained at a temperature of about 100° C. This treatment disposes of the water and other liquids in the centrifuge, and delivers in substantially dry condition a fibrous 45  
mass, loaded with the impregnated chemicals, which it is found consists of comparatively hard particles comprising fibres tightly bound or matted together. These fibres are then ready to be unravelled and reformed as a thin, 50  
loosely felted layer or web as indicated above.

A ribbon of fibrous material thus formed as a loosely felted mass is used for the manufacture of tampons, wads or the like, as 55  
aforesaid, by cutting it into suitable lengths by convenient mechanical means as it approaches the end of its run on the vibratory conveyor belt. Each cut length may then be formed into a tampon or wad. If the tampons or 60  
wads are to be provided with an outer covering of film or sheet, as previously described, each cut section may be delivered by the belt on to a ribbon of covering material (which may conveniently run beneath, and transversely of, the end of the conveyor belt). The 65  
ribbon covering material after receiving sec-

tions of the matted fibrous layer, may be cut into suitable lengths, each corresponding to one section, and folded or rolled up and sealed to protect the internal fibres. The rolling may be effected by any convenient means, and the 70  
sealing may conveniently be effected by moistening contacting surfaces of the covering material so that they adhere when brought together.

In carrying the abovementioned process into 75  
effect there is fed into a freely swinging hammer screen pulveriser mill the fibrous material being used, e.g. cellulose ether in a fibrous form. This material which is in substantially dry condition, may have been 80  
previously impregnated with chemicals as desired. The rate of feed and passage of the material, and the operation conditions of the mill, are selected to ensure that in the material delivered from the mill outlet the individual 85  
fibres are loosened or separate from one another.

The mill outlet is located above an endless belt conveyor and comprises a slot of length approximately equal to the width of the belt 90  
through which pass the fibres at a desired rate. The outlet slot extends transversely of the belt, with the result that as the belt advances it carries forward a shallow layer of loose fibres evenly spread over the belt sur- 95  
face. Any suitable means are provided to maintain the belt in vibration transversely of its direction of movement and/or in a vertical sense. As a result of this vibration the fibres are caused to settle down and become felted 100  
or matted together. The conditions of vibration and the length of the vibratory path traversed by the fibres is selected to ensure a desired degree of compactness of the fibres and thus a prearranged thickness of the felted 105  
layer, which may conveniently be about  $\frac{1}{16}$ th inch.

Near to the delivery end of the belt are provided any suitable means for cutting the felted fibrous ribbon into desired lengths. Since sections of about 6" by 2" are required the belt 110  
may be 6" wide and cutting effected at every 2", or the belt may be 2" wide and the ribbon cut at 6" intervals. When the fibres are suitably compact each section measuring 6" by 115  
2" by  $\frac{1}{16}$ th inch may weigh approximately 1.5 to 2 grammes.

At and beneath the delivery end of the belt there is moved a strip of covering material which may conveniently be of the same 120  
material, (i.e. cellulose ether, whether or not impregnated with chemicals), in sheet form. Each cut section of the felted fibre ribbon is delivered on to this covering strip and carried forward thereon to suitable cutting means 125  
whereby the covering strip is transversely severed. The covering section with the felted fibres thereon is thereafter folded or rolled so that the fibres are adequately covered and protected by the covering which is sealed by 130

twisting the ends and/or by moistening the contacting surfaces or applying an adhesive. The tampon is then complete.

The apparatus referred to above, e.g. wrapping machine, conveyor belts vibration-generating means, and pulveriser mill, may be of any convenient known kind, and since they are not *per se* part of the present invention, are not described in detail.

10 Tampons, wads and the like such as described above have wide and varied uses in medical and surgical practice. The fibrous materials from which they are made have the property that in absorbing moisture they expand slowly and form stiff viscous colloidal gels, which ensure that the impregnated chemicals are maintained in contact with the tissues, and remain in active condition and position for a longer period than they would if applied in any other way. For certain purposes the tampons or wads are applied in a dry state, e.g. in vaginal surgery, in the surgery of the cervix and uterus, and in the surgical repair of lesions caused by labour, or by spontaneous or induced abortion. For these purposes the tampons or wads are required in surgically sterilised condition, and air-dry impregnated fibres may be sterilised by heating in an autoclave at temperatures up to 130° C. for periods up to thirty minutes. The use of such tampons and wads lengthens the period of continuous medication without renewal of dressings for beyond any such period achievable by techniques at present known.

When employed for non-surgical cases the tampons or wads need not be sterilised, and they may be employed either dry (carrying the pre-medication in an air-dry state), or in conjunction with an emulsion or stiff viscous gel (when they serve as a mechanical positioning vehicle for the emulsion or gel, and increase its viscous properties and its adhesion to the affected surface). Whether dry or wet the tampons may be impregnated during manufacture with any of a wide range of drugs or chemicals for therapeutic treatment of many pathological conditions; and/or a wide range of synthesised or extracted hormones to hasten or delay vascular or muscular responses in the pelvic region, before or after labour, in the reduction of vaginismus and other neuromuscular spasms. By way of example the following list sets out various drugs, hormones and the like which may be employed for various specified pathological and like conditions.

i. For the treatment of pathogenic infections of the area e.g. excessive process of *B. coli* or infections of *C. albicans* and for superficial infections of gonococcus, the tampon or wad may be impregnated with sulphathiazole.

ii. For invasions of bacterial organisms, other than *B. coli*, the tampon or wad may be impregnated with proflavine.

iii. For very early treatment of the conditions indicated under i above, and where the patient is intolerant of proflavine, the tampon or wad may be impregnated with ichthammol.

iv. For the trichomonas of the vagina and cervix, the tampon or wad may be impregnated with acetarsone, or lactic acid.

v. For long established conditions of diffused vaginitis, and for conditions such as that generally known as pruritus, the tampon or wad may be impregnated with extracted or synthetic oestrogen.

vi. For the checking of bleeding from superficial cervical lesions after labour, the tampon or wad may be impregnated with adrenalin, ephedrin and synthetic compounds known to be vaso-constrictors.

vii. During the preliminary stages of labour, the tampon or wad may be impregnated with posterior pituitary extracts or synthetises of these.

viii. In vaginismus the tampon or wad may be impregnated with vaso-dilators.

ix. For the maintenance of pregnancy at anticipated critical days e.g. from the 82nd to 85th day and from the 110th to the 114th day counting the onset of last period before conception the tampon or wad may be impregnated with oestrin compounds.

From the above description it will be seen that the invention provides a tampon, wad or the like, suitable for use in medical practice, which is comparatively simple and cheap to manufacture, and use, and provides adequate protection against bacterial action, without damaging the human tissues with which it may come into contact. It should, however, be understood that the invention is not restricted solely to the details of the form described above which may be modified, in order to meet various conditions and requirements encountered, without departing in any way from the scope of the invention.

What I claim is:—

1. A prophylactic or therapeutically-active material for medical purposes comprising a lightly compressed mass of fibres or fibrous material of a kind wholly and completely soluble or dispersible in water and in body fluids, at body temperature, impregnated with chemicals having prophylactic or therapeutic properties.

2. A material as claimed in Claim 1 wherein the lightly compressed mass comprises soluble alginate fibres.

3. A material as claimed in Claim 1 or 2 formed by teasing and/or drawing out a fibrous mass into a band or ribbon, and thereafter rolling the band or ribbon into rope form.

4. A material as claimed in Claim 3 wherein the fibrous band or ribbon is impregnated with chemicals adapted to form a barrier to living organisms, before being rolled into rope form.

5. A material as claimed in any of Claims 1—4 wherein the said chemicals include an oil, preferably a fungicidal oil, e.g. liquid paraffin, or castor oil.
6. A material as claimed in any of Claims 1—5 wherein said chemicals include an acid or acid solution, e.g. lactic acid, boric acid, citric acid or acetic acid, or a ricinoleic acid emulsion.
7. A material as claimed in Claim 6 wherein the acidulation of the chemical materials is adjusted to a pH reading between 3.5 and 4.5, and preferably about 3.8.
8. A tampon or wad as claimed in any of Claims 1—7 wherein the chemicals are emulsified with a gel-forming material, e.g. gum tragacanth, bassorin gum, agar-agar or sodium alginate, with or without glycerine.
9. A material as claimed in any preceding Claim comprising a length of the fibrous mass externally coated, e.g. by spraying or dipping, with an oil.
10. A tampon or wad comprising a pre-formed length of fibrous mass as claimed in any preceding claim provided, e.g. by spraying or immersion, with a final outer coating of soluble or dispersible material, e.g. sodium or ammonium alginate or ethyl hydroxyethyl cellulose, adapted to form a rather stiff smooth surface.
11. A tampon or wad comprising a pre-formed length of fibrous mass as claimed in any preceding claim, wrapped in a pre-formed film or sheet of soluble or dispersible material.
12. The method of preparing a material as claimed in any of Claims 1—9 which includes the step of teasing or opening out the fibres comprised in the mass by means of a mill (e.g. a swinging hammer mill).
13. The method of preparing a material as claimed in any of Claims 1—9, or the method as claimed in Claim 12, which includes the step of impregnating the fibres with selected chemicals in a centrifuge.
14. The method of preparing a material as claimed in any of Claims 1—9, or the method as claimed in Claim 12 or 13, wherein the fibres of fibrous mass after being teased or carded is/are "felted" or matted together to a controlled extent by deposition on a vibratory surface.
15. The method as claimed in Claim 14 wherein the vibratory surface comprises a conveyor belt upon which the fibrous mass is carried between one or more initial operations of impregnation with chemicals and/or carding, and later operations of cutting into lengths and/or coating, covering or wrapping.
16. A prophylactic or therapeutically active material, for medical uses, comprising a lightly compressed mass of soluble or dispersible fibres or fibrous materials, impregnated with chemicals, substantially as described herein.
17. A method of preparing a prophylactic or therapeutically-active soluble or dispersible fibrous material, substantially as described herein.
18. A tampon, wad or the like formed of a prophylactic or therapeutically-active soluble or dispersible fibrous material, substantially as described herein.

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#### PROVISIONAL SPECIFICATION No. 18475, A.D. 1952.

#### Improvements in and relating to Tampons and the like

I, EDWARD CHARLES EDMUND HEMSTED, a British Subject, of Woodcroft, Tottenham Green, London, N.20, do hereby declare this invention to be described in the following statement:—

This invention relates to tampons and the like used for medical and therapeutical purposes.

According to one feature of the present invention a tampon or wad suitable for therapeutic purposes comprises a lightly compressed mass of soluble or dispersible fibres or fibrous material.

According to a further feature of the invention a tampon or wad suitable for therapeutic purposes comprises a lightly compressed mass of fibres or fibrous material provided with a surface coating or crust of soluble material adapted both to protect the fibres from contamination prior to use, and to provide

sufficient rigidity for handling, and manipulation in use.

According to yet another feature of the invention a tampon or wad suitable for therapeutic purposes comprises a lightly compressed mass of fibres or fibrous materials impregnated with chemicals adapted to form an effective barrier to living organisms. The impregnated chemicals are preferably in liquid or gelatinous form and may comprise an oil or the like (adapted to serve as a physical barrier) and/or an acid or the like (serving as a bactericide). The chemicals may be prepared as an emulsion or gel for application to the fibrous mass which may be coated, as indicated above, after the chemicals have been applied thereto. The fibrous matter and coating is preferably formed of materials which are self eliminating by solution or dispersion after, say, 24—72 hours in use. The tampon

according to the invention may be of cylindrical form with rounded ends, or pear shaped, or of any other desired shape, and may be formed by twists in a rope of fibrous material as it is drawn through its various stages of treatment.

The invention will be clearly understood from the following description of one form (given, however, merely by way of example) which it may assume.

In carrying the invention into effect in one convenient manner a tampon or wad suitable for therapeutic purposes is formed by appropriate pre-shaping and pre-treatment of a fibrous mass which is soluble or dispersible during and after use, within a period of, say 24 to 72 hours. While any fibres (not excluding synthetic fibres) having such characteristics may be employed, preferred materials so far considered comprise algin fibres or gelatin fibres (e.g. the foam gelatine). This material is teased and drawn out into a continuous band or ribbon of, say six inches in width, and few fibres in thickness, and the band is impregnated with an oil and thereafter by an emulsion or gel.

The emulsion or gel preferably included an oil, and while any bland oil would form the desired barrier, it is preferred to use one or more mineral oils, there being free from the tendency to become rancid or to encourage bacterial growth characteristic of animal or vegetable oils. A suitable oil is liquid paraffin B.P.

The emulsion or gel preferably includes a bactericidal agent which may conveniently comprise water acidified by the addition of one or more suitable acids, e.g. ricinoleic acid, formic acid, boric acid, citric acid, acetic acid etc.

The chemical materials indicated above are preferably formed as a gel of suitable concentration with water, by the use of suitable gel-forming material, e.g. gum tragacanth, basorin gum, agar-agar, sodium alginate etc., with or without glycerine to facilitate saturation. The gel having been formed from such materials is supplemented by added bactericidal materials (e.g. one or more of the acids referred to above) and/or by the addition of other medicaments (e.g. for the treatment of leucorrhoea). The acidulation should be adjusted so that the hydrogen ion give a pH reading between, say 3.5 and 4.5, and preferably about 3.8.

The gel prepared as indicated above, and the oil referred to above are thereafter emulsified in suitable apparatus preferably with the assistance of an acid-stable emulsifying agent, e.g. Tegacid. The final emulsion is preferably of substantial viscosity, corresponding for example to that of stiff treacle, and should remain stable within a normal ambient temperature range and storage conditions (bearing in mind that it may be used in the tropics).

The aforesaid band or ribbon of fibrous material is impregnated with the above-described emulsion by being passed on a belt carrier or the like through a tank or trough containing the emulsion, or running between 70 rollers or other mechanical means to which the emulsion is fed. After impregnation the band is freed from excess emulsion by light roller pressure or the like and is then removed from the carrier belt by a rolling action at 75 about 45° to the direction of movement of the belt so that it is withdrawn as a continuous rope of cylindrical form, having a diameter of, say 1—1½ inches.

An impregnated rope formed in the manner described above is finally cut into suitable lengths for use, and the lengths externally coated with a soluble or dispersible covering material. For this purpose the rope is twisted through 360° at suitable intervals, say 2—2½ 85 inches, in order to provide a taper at each end of each section, and the sections separated by cutting the rope at necks formed by the twisting, between the sections.

The cut sections are then chilled to, say 90 40—42° F., by placing them in or passing them through refrigerating apparatus, and while at that temperature are lightly sprayed with, or rapidly dipped in a bath of, an oil, e.g. petroleum oil, somewhat denser than the 95 paraffin or other impregnated oil. A suitable oil-covering is that known under the Registered Trade Mark "Vaseline". This tends to harden on the surface of the rope section, which is thereupon provided with a final 100 outer coating of soluble or dispersible material, adapted to provide a rather stiff, smooth surface. A suitable material for this final coating is an alginate. This may be applied by spraying on to the rope section, or 105 by immersing the section in it, whereafter the coating should be rapidly dried to give a glazed, semi-rigid coating. The tampon is then ready for packing, storage and subsequent use. 110

In a modified form of the invention wherein the emulsion is more fully protected from deterioration and the like, the emulsion, prepared as described above may be encased in a very thin soluble container e.g. of gelatin or 115 an algin, and the fibrous ribbon, prepared and impregnated with oil as described above, may be wrapped round this container. The rolled fibrous material may then be cut and formed into short lengths as previously 120 described.

From the above description it will be seen that the invention provides a tampon which is comparatively simple and cheap to manufacture, and use, and provides an adequate barrier 125 to the passage of living organisms, without damaging the human tissues with which it comes into contact. It should, however, be understood that the invention is not restricted solely to the details of the form described 130



above which may be modified, in order to meet various conditions and requirements encountered without departing in any way from the scope of the invention.

Dated this 22nd day of July, 1952.  
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PROVISIONAL SPECIFICATION  
No. 32214, A.D. 1952.

Improvements in and relating to Tampons and the like

I, EDWARD CHARLES EDMUND HEMSTED, a British Subject, of Woodcroft, Totteridge Green, London, N.20, do hereby declare this invention to be described in the following statement:—

10 This invention relates to tampons and the like, and more especially, although not exclusively, to tampons, wads and the like formed of material which is soluble or dispersible so as to be self-eliminating after use.

15 The object of the invention is to provide means for protecting a tampon or the like from decontamination prior to use, and to maintain the therapeutic qualities of the body of the tampon in good condition.

20 The invention consists in a method of protecting tampons and the like which comprises the step of wrapping or encasing the tampon or the like in an outer covering formed of a film or sheet of soluble or dispersible material.

25 The film or sheet of material may be cut into suitable portions for separately covering the tampons, and wrapped or otherwise formed as a cover around the tampon. Preferably the wrapping or covering is sealed (e.g. by use of water whereby the material is partially dissolved) during the encasing operation.

30 The invention also consists in a tampon wad or the like encased in a covering comprising a portion of preformed sheet or film of soluble or dispersible material. The material employed should be selected after consideration of the conditions to which it is to be subjected; e.g. for tropical conditions it should remain firm and unaffected by tropical temperatures and 40 humidity. A suitable material, referred to by way of example is cellulose ether. It will be noted that the invention is very suitable for tampons, wads, etc. which are themselves formed of soluble or dispersible material, since 45 the wrapped tampon can be employed without removing the covering which dissolves or dispenses with the tampon proper.

In carrying the invention into effect in one convenient manner there may be employed any convenient wrapping machine, such as a 50 machine used for wrapping toffees, sweetmeats and the like in transparent film. To such a machine is supplied a sheet or strip, in film thickness, of a soluble material, such as a cellulose ether, e.g. that known under the Registered Trade Mark "Modocoll M", and the 55 tampons or the like are loaded into a hopper or bin of the machine which thereupon wraps each tampon in a portion of the film material cut from the sheet or strip, and ejects it. The 60 ends of the wrapped covering may be twisted or nipped together, and in either case it is preferred that the edges, and twisted or nipped ends of the material shall be moistened, and if necessary thereafter subjected to heat, or a 65 hot air stream, in order that they may become softened and sealed together. If the ends are twisted, they may be turned so far as to be broken away from the main part of the covering, to leave a reasonably smooth end to the 70 wrapped tampon.

This invention is very suitable for use with tampons and the like as described in the specification of copending British Patent Application No. 18475/52. 75

It should be understood that the invention is not limited solely to the details described above, or to the manner in which the wrapping or covering is performed, or to the material used provided it is soluble or dispersible in process of, or after, use, since all 80 these details may be modified, in order to meet various conditions and requirements encountered, without departing in any way from the scope of the invention. 85

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PROVISIONAL SPECIFICATION  
No. 32969, A.D. 1952.

Improvements in and relating to the treatment of Fibrous Materials

I, EDWARD CHARLES EDMUND HEMSTED, a British Subject, of Woodcroft, Totteridge Green, London, N.20, do hereby declare this invention to be described in the following 90 statement:—

This invention relates to the treatment of

fibrous materials, more especially synthetic fibrous materials suitable for medical or other uses.

It is sometimes desired to form such 95 materials into strips or portions in which the fibres are loosely "felted" or matted together,

and the object of the present invention is to provide a method of, and means for, achieving this result simply and effectively.

According to the present invention a mass of fibrous material is teased or opened out to separate the different short lengths of fibre which are then deposited on a vibrating surface whereby the fibres are caused to matt or "felt" into a soft uniform layer of desired thickness and compactness. The teasing or opening up of the fibres may be effected by a mill, (e.g. a swinging hammer mill in which freely swinging hammers on a rotor move adjacent to a screen but are so mounted that they are unable to contact one another or the screen). The vibrating surface may be a conveyor belt maintained in vibration in a direction transversely to its conveyor movement. The violence and duration of the vibrating treatment of the separated fibres is selected to ensure the desired degree of "felting". The fibres may be delivered on to the vibrating surface through an outlet hopper of the mill, and the rate of delivery is selected, (having regard to the rate of movement of the conveyor belt, if that constitutes the vibrator surface) so as to ensure that the amount of fibrous material is suitable to provide a felted layer of the desired thickness.

The present invention is very suitable for preparing fibrous materials for the manufacture of tampons as described in the specification of copending Patent Application No. 18475/52. For this purpose it is preferred to use a synthetic fibrous material such as a cellulose ether, and if desired this may be impregnated with chemicals before being subjected to the treatment above referred to. Such impregnation may be carried out by bringing together a solution or suspension of chemicals, and moist fibrous cellulose ether in a centrifuge revolving at high speed and maintained at a temperature of about 100° C. This treatment disposed of the water and other liquids in the centrifuge, and delivers in substantially dry condition a fibrous mass, loaded with the impregnated chemicals, which it is found consists of comparatively hard particles comprising fibres tightly bound or matted together. The present invention is particularly suited to unravel these fibres and to reform them as a thin, loosely felted layer or web very suitable for manufacture of the aforesaid tampons.

When a ribbon of fibrous material formed as a loosely felted mass in accordance with the present invention is intended for the manufacture of tampons it may be cut into suitable lengths by convenient mechanical means as it approaches the end of its run on the vibratory conveyor belt, and each cut section may then be delivered by the belt on to a ribbon of covering material (which may conveniently run beneath, and transversely of, the end of the conveyor belt); and this covering material is preferably water-soluble, and may be of the

same composition as the matted fibres, e.g. cellulose ether. It may or may not be similarly impregnated with chemicals. The ribbon covering material after receiving sections of the matted fibrous layer, may be cut into suitable lengths, each corresponding to one section, and folded or rolled up and sealed to protect the internal fibres. The rolling may be effected by any convenient means, and the sealing may conveniently be effected by moistening contacting surfaces of the covering material so that they adhere when brought together.

The invention will be clearly understood from the following description of one form (given, however, merely by way of example) which it may assume.

In carrying the invention into effect in one convenient manner when manufacturing tampons there is fed into a freely swinging hammer screen pulveriser mill the fibrous material being used, which is conveniently cellulose ether in fibrous form. This material which is in substantially dry condition, may have been previously impregnated with chemicals as desired. The rate of feed and passage of the material, and the operating conditions of the mill, are selected to ensure that in the material delivered from the mill outlet the individual fibres are loosened or separate from one another.

The mill outlet is located above an endless belt conveyor and comprises a slot of length equal to approximately the width of the belt, through which pass the fibres at a desired rate. The outlet slot extends transversely of the belt, with the result that as the belt advances it carries forward a shallow layer of loose fibres evenly spread over the belt surface. Any suitable means are provided to maintain the belt in vibration transversely of its direction of movement and/or in a vertical sense. As a result of this vibration the fibres are caused to settle down and become felted or matted together. The conditions of vibration and the length of the vibratory path traversed by the fibres is selected to ensure a desired degree of compactness of the fibres and thus a pre-arranged thickness of the felted layer, which may conveniently be about  $\frac{3}{16}$  inch.

Near to the delivery end of the belt are provided any suitable means for cutting the felted fibrous ribbon into desired lengths. Since sections of about 6" by 2" are required the belt may be 6" wide and cutting effected at every 2", or the belt may be 2" wide and the ribbon cut at 6" intervals. When the fibres are suitably compact each section measuring 6" by 2" by  $\frac{3}{16}$  inch may weigh approximately one gramme.

At and beneath the delivery end of the belt there is moved a strip of covering material which may conveniently be of the same material, (i.e. cellulose ether, whether or not impregnated with chemicals), in sheet form.



Each cut section of the felted fibre ribbon is delivered on to this covering strip and carried forward thereon to suitable cutting means whereby the covering strip is transversely severed. The covering section with the felted fibres thereon is thereafter folded or rolled so that the fibres are adequately covered and protected by the covering which is sealed by twisting the ends and/or by moistening the contacting surfaces or applying an adhesive. The tampon is then complete.

It should be understood that the invention is not limited solely to the details of the form described above which may be modified, in order to meet various conditions and requirements encountered, without departing from the scope of the invention. 15

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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1955.  
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

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